

IBM z16 family Technical Overview

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IBM z16™ is built to build

We built a powerful and secure platform for business.
Let's build the future of yours.



Predict and Automate for
Increased Decision Velocity



Secure with a Cyber
Resilient System



Modernize with
Hybrid Cloud

IBM z16 product portfolio



IBM z16 Multi-Frame

Designed to support the growth in IT requirements for multi-frame clients, with superior scalability & efficiency with up to 200 cores



IBM z16 Single Frame

Designed for roll-in, roll-out single-frame clients, providing enriched capabilities and improved performance per core



IBM z16 Rack Mount

New entry point Rack Mount option
Components designed for colocation
Parallel scalability to Single Frame
SSR-installed for high reliability & serviceability

Enterprise-grade AI on IBM z16

Infusing AI into business-critical applications

Applying AI for operational excellence



- Intersection of transaction and data
- Minimize latency for real-time insights
- Avoid risks and cost of data copies
- Embed AI while meeting stringent SLAs
- Leverage existing AI models and skills



- Accurately identify emerging problems across the Hybrid Cloud
- Diagnose & fix problems fast in dynamic and complex environments
- Resolve swiftly with intelligent automation

IBM z16 industry-first quantum-safe system



Quantum-safe cryptography to protect your business against quantum attacks now and into the future

Industry first quantum-safe system

Protected by quantum-safe technologies through multiple layers of firmware

Protect sensitive data

Quantum-safe APIs to modernize existing and build new applications leveraging quantum-safe cryptography

Create crypto inventory

Discover where and what crypto is used in applications to aid in migration planning

*“**Act now** – it will be less expensive, less disruptive, and mistakes caused by rushing and scrambling are less likely to be made.” – NIST*

IBM Flexible Capacity for Cyber Resiliency



Designed to enable a proactive approach to address business continuity requirements

Greater flexibility

Dynamically shift production capacity between IBM z16 systems at different sites within seconds

Complete client control

Remotely transfer capacity up to 12 times per year and remain at the alternate site for up to one year.

Simplified compliance

Improve audit readiness by using the same procedures for DR testing and real unplanned disasters.

IBM System Recovery Boost



Over **95%** of IBM z15 customers with System Recovery Boost (SRB) eligible systems, are using System Recovery Boost to unleash additional processing capacity.¹

IBM z16 delivers more System Recovery Boost capabilities

Middleware restart

Accelerate the restart and recycle of client-specified middleware environments

up to 35% faster³

SVC dump processing

Accelerate the SVC dump diagnostics capture process

up to 30% faster⁴

HyperSwap config load

Accelerate the process of loading HyperSwap configuration

IBM Z Security and Compliance Center



Assess enterprise-level compliance posture

Control to the level you need

Present your reports in a readable way

Identify & track compliance drift

PCI Weekly Review

[View timeline](#)

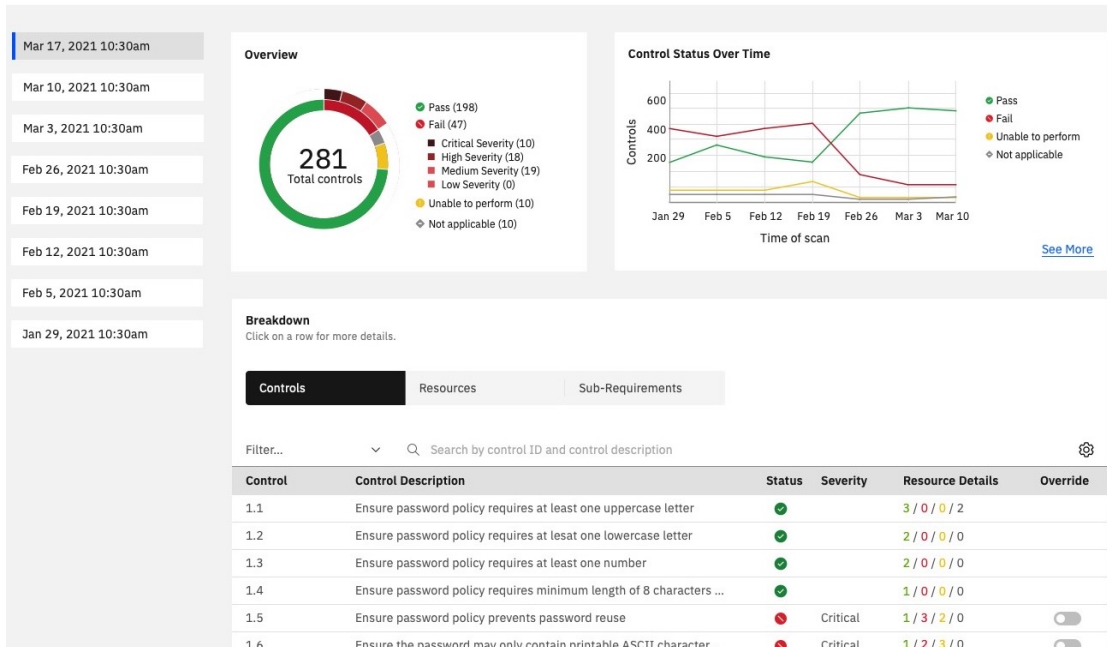
[Generate a report](#)

Scope: PCI_DSS_SCOPE

Profile: PCI DSS 3.2

Last Scan: March 17, 2021, 17:30

Next Scan: March 24, 2021, 17:30



IBM z16 sustainability



Built for the modern data center to optimize flexibility and sustainability

Product Lifecycle

Product Attribute to Impact Algorithm (PAIA) carbon footprint reports for understanding lifecycle carbon emissions and sustainability



Energy Efficiency

- Flexibility of UX energy trend dashboards or API management
- Partition **partition-level power statistics** providing operational insights into workloads on the platform
- Integration with commercial DCIM tools

Circular Economy

Increase renewable / reusable / recyclable material content

Recycle or reuse at least 97% of end-of-life product waste

Goal to eliminate nonessential plastics from product packaging by 2024

Reduce shipping size and weight

IBM z16 Multi-Frame

Flexible compute design

- Available in one to four 19" frames based on capacity needs
- Two power options – iPDU for electrical efficiency and Bulk Power Assembly, no Internal Battery Feature
- Industry's first quantum-safe system with new Crypto Express8S card

IBM Telum Processor

- 7nm technology, 5.2 GHz, 4 Dual Chip Modules (DCM) per CPC drawer
- 8 Cores/Chip, 2 Chips/DCM
- Up to 200 client configurable cores
- New integrated AI Accelerator capability of processing up to 300B deep learning inference request per day with 1ms latency
- **11% single-thread performance improvement and 17% maximum system capacity growth over IBM z15™**
- 25% more processor capacity per drawer over IBM z15

Memory

- Up to 40 TB RAIM memory
- 25% more memory capacity per drawer over IBM z15
- Transparent memory encryption
- 32 TB memory per LPAR, 2x more per LPAR than IBM z15

To the Data

- 54% increase in throughput with new FICON Express32S compared to IBM z15 FICON Express 16S
- 25% improvement in Coupling Facility write requests over IBM z15 for short-reach coupling express links
- Execute up to 14 million encrypted FCP read IOPS using the IBM Fibre Channel Endpoint Security solution
- Up to 25 billion encrypted z/OS OLTP transactions per day

IBM z16

Machine type: 3931
Model A01



CPC Drawers	Client PUs	Max Memory
1	39	10 TB
2	82	20 TB
3	125	30 TB
4	168	40 TB
4 (Max)	200	40 TB

IBM z16 Single Frame & Rack Mount

IBM Telum Processor

- New Integrated AI Accelerator for high-speed inferencing, in addition to accelerators for encryption and compression
- 7nm technology @ 4.6 GHz, up to 4 Dual Chip Modules (DCMs) per CPC drawer
- 8 cores/chip, 2 chips/DCM
- **13% single-thread performance improvement** over z15 T02
- Quantum-Safe system, leveraging new Crypto Express8S HSMs

Flexible compute design

- Up to 68 client-configurable cores
 - Up to 6 standard CPs, up to 67 zIIPs, up to 68 IFLs or ICFs
- Up to **14% max system capacity growth** over z15 T02 with z/OS
- Up to **21% max system capacity growth** over z15 T02 with Linux on Z
- IBM-provided Single Frame for roll-in, roll-out ease, or Rack Mount configuration for client-supplied rack infrastructure
- Up to 3 I/O PCIe+ drawers available for I/O expansion up to 48 adapters
- FICON Express32S for enhanced speed and consolidation opportunities

Memory

- Up to 16 TB RAIM memory with physical memory encryption
- 2 TB Virtual Flash Memory

IBM z16 4.6 GHz

Machine Type 3932
Single Frame offering A02
& Rack Mount offering AGZ

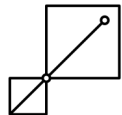
Drawer Sizing

CPC Drawer	Client PUs	Max Memory
1	32	8 TB
2	68	16 TB

Feature-Based Sizing

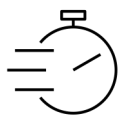
CPC Feature	Client PUs	Max Memory
Max 5	5	4 TB
Max 16	16	4 TB
Max 32	32	8 TB
Max 68	68	16 TB

IBM Telum processor design



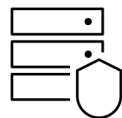
Performance and Scale

- Optimized core
- New, flexible virtual cache hierarchy



Embedded accelerators

- Integrated accelerator for AI
- Sort, compression, cryptography



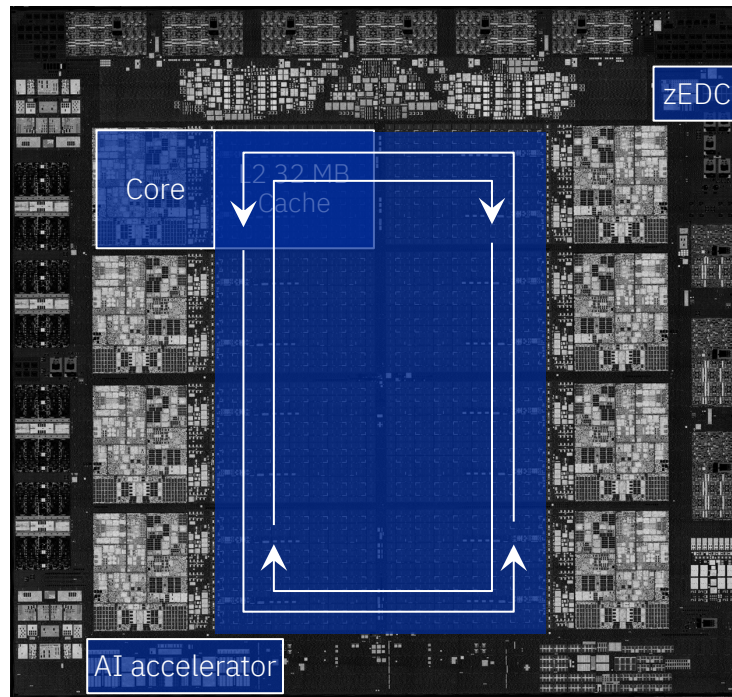
Industry-leading security

- Transparent memory encryption
- Improved Trusted Execution Environment



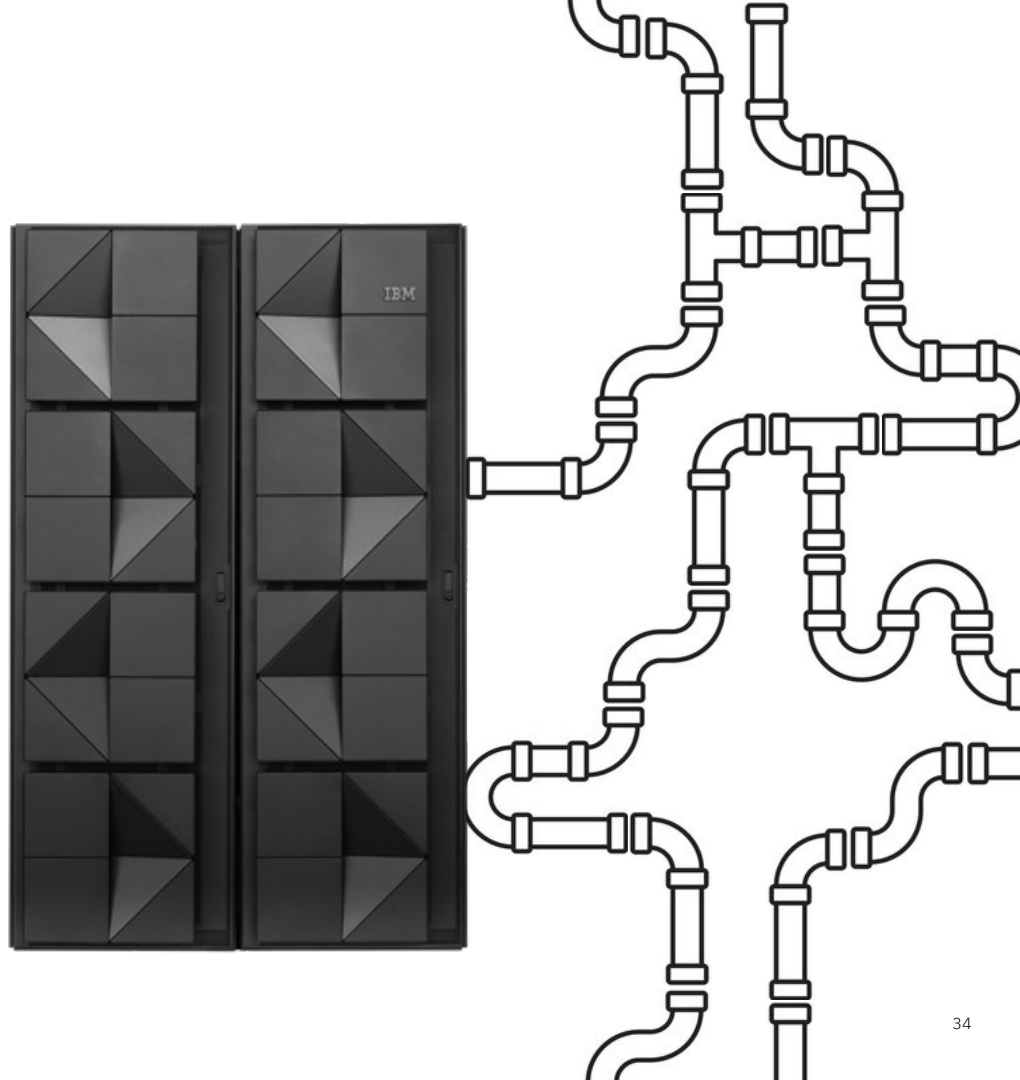
Unmatched reliability and availability

- Error correction and sparing
- Redundant Array of Independent Memory



IBM z16

I/O considerations



New build I/O features

Description	Feature Code
Coupling Express2 LR 	0434
ICA SR 1.1	0176
10GbE RoCE Express3 SR 	0440
10GbE RoCE Express3 LR 	0441
25GbE RoCE Express3 SR 	0452
25GbE RoCE Express3 LR 	0453
zHyperLink 1.1	0451
Crypto Express8S 	0909
Crypto Express8S 	0908

Description	Feature Code
OSA Express7S 1.2 25GbE SR 	0459
OSA Express7S 1.2 25GbE LR 	0460
OSA Express7S 1.2 GbE LX 	0454
OSA Express7S 1.2 GbE SX 	0455
OSA Express7S 1.2 10GbE LR 	0456
OSA Express7S 1.2 10GbE SR 	0457
OSA Express7S 1.2 1000BASE-T 	0458
FICON Express32S LX 	0461
FICON Express32S SX 	0462

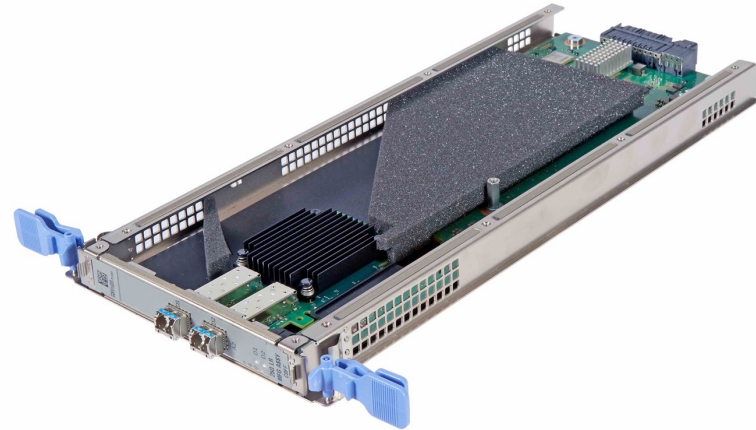
OSA Express updates and strategy

- OSA Express7S 1.2 family includes 1000BASE-T, 1 GbE (LX, SX), 10 GbE (LR, SR), and 25 GbE (SR, **LR**) adapters
- CHPID type OSE **will not be supported** after IBM z16
- OSA Express 1000BASE-T cards **will not be supported** after IBM z16
- CHPID type OSC supported on 1 GbE cards today
- **IBM recommendation:** begin migrating functionality off 1000BASE-T cards to 1 GbE cards during IBM z16 timeframe



RoCE Express updates and strategy

- New RoCE Express3 family includes 10 GbE (SR, LR) and 25 GbE (SR, LR)
- RoCE Express features on IBM z16 provide remote memory-to-memory communications between servers, reducing network latency and CPU consumption compared to TCP/IP
- RoCE Express adapters will be the [strategic direction](#) for direct-access networking on Linux on IBM Z after IBM z16
 - This change will not affect z/VM VSwitch clients
- SMC-Rv2 with RoCEv2 and SMC-Dv2 with ISMv2 are available with z/OS 2.4 and 2.5 and allow for connections to be routed, no longer restricting connections to the same IP subnet



Recommendation: Linux on IBM Z clients should consider moving to RoCE Express adapters in the IBM z16 timeframe for their network connectivity

IBM z16 Coupling Links

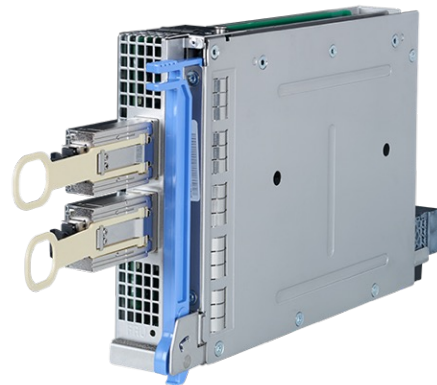
Integrated Coupling Adapter SR1.1

- IBM z16 enhanced protocol designed to lower latency and improve CF service times
 - Provides the potential to lower software costs
- PCIe Gen3, fanout in the CPC drawer, 2 ports per fanout, 150m

Coupling Express2 LR

- Benefit from CE LR's larger receive buffer & resource context cache
- Compatible with previous generation links (Coupling Express LR)
- 2-port adapter, CHPID CL5 up to 4 CHPIDs per port, 32 subchannels/CHPID, 10 Gbps
- Distance: 10 km unrepeated; up to 100 km with qualified DWDM

IBM z16 can participate in a sysplex with **IBM z14** and **IBM z15**



*The link data rates do not represent the performance of the links. The actual performance is dependent upon many factors including latency through the adapters, cable lengths, and the type of workload.

Crypto Express8S

Invoke [Quantum-Safe Crypto APIs](#) accelerated by Crypto Express 8S to build Quantum-Safe cryptography into your applications

- Asymmetric algorithms:
 - CRYSTALS-Kyber requires CEX8S
 - CRYSTALS-Dilithium requires CEX7S+
 - Both selected for NIST standardization
- Symmetric algorithm: AES-256
- Hashing algorithms: SHA-2 and SHA-3

Generate secure keys for [Pervasive Encryption](#) using Crypto Express 8S

- z/OS Data Set Encryption
- Coupling Facility Encryption
- JES2 Spool Encryption
- Encrypted RACF Database

Improve operational performance using [protected keys](#) generated from secure keys with Crypto Express 8S



Utilize [Quantum-Safe Secure Boot](#) hybrid schemes on Crypto Express 8S to protect system initialization

- CRYSTALS-Dilithium + ECDSA

Protect digital wallets on your [Digital Assets Platform](#) using Crypto Express 8S

Enhance and simplify [key management](#) with:

- EKMF Workstation support for Quantum-Safe keys
- EKMF Web for Pervasive Encryption key management
- TKE Workstation support for Quantum-Safe mini-boot, and inbound & outbound communications to Crypto Express 8S
- GKLM Container Edition for secure key management

Hardware Management Appliance (HMA)

- Standalone HMCs are no longer available as part of a New Build IBM z16 configuration
- Older standalone HMCs can be carried forward and their code can be upgraded to support IBM z16
- IBM z16 HMA will only support N-2 systems and newer
- On the IBM z16, HMC code runs as an appliance on two top-of-rack servers along with SEs
 - One HMA feature code (0129) provides **two HMAs**
 - HMA can be ordered via MES after an IBM z16 is installed
 - Can log on to the HMC remotely from a browser and log onto the SE from the HMC



IBM recommendation:

Clients should not configure HMAs on more than two systems per site to reduce complexity while maintaining sufficient redundancy

IBM z16 and LinuxONE Rockhopper 4 operating system support

z/OS

- z/OS 2.5 with PTFs
- z/OS 2.4 with PTFs
- z/OS 2.3 (compatibility only)
 - IBM Software Support Services purchase required
- z/OS 2.2 (compatibility only)
 - IBM Software Support Services purchase required

z/VM

- z/VM 7.3 with PTFs
- z/VM 7.2 (compatibility only)

z/VSE

- [VSEⁿ V6.3 – 21st Century Software](#)



z/TPF

- z/TPF 1.1 with PTFs

Linux on IBM Z

Minimum Distributions:

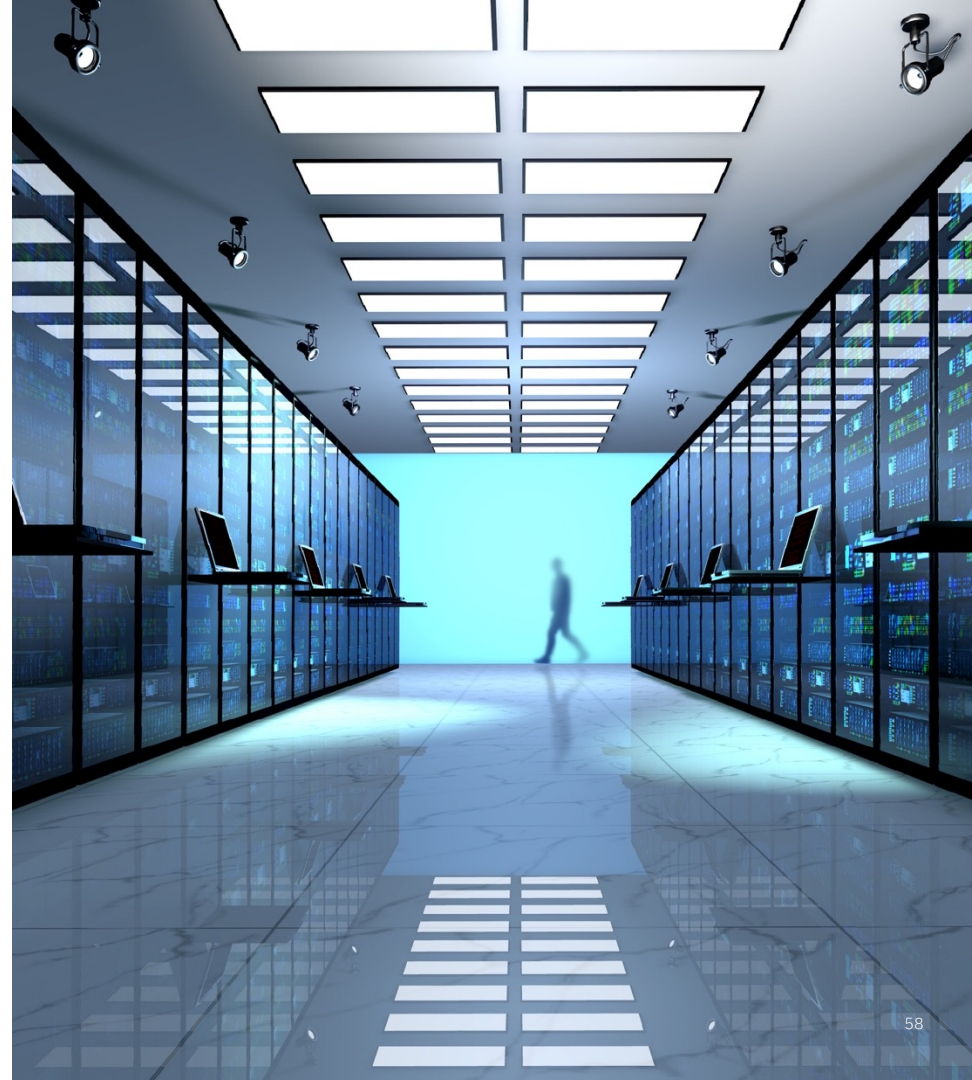
- SUSE SLES 15 SP3
- SUSE SLES 12 SP5
- Red Hat RHEL 9.0
- Red Hat RHEL 8.4
- Red Hat RHEL 7.9
- Canonical Ubuntu 22.04.0x LTS
- Canonical Ubuntu 20.04.0x LTS

IBM cannot legally discuss z16 exploitation prior to GA from distributors.

Officially Tested list [here](#).

IBM z16 Multi Frame physical planning overview

- Continues the modular, 19-inch frame footprint innovations introduced with z14 ZR1, IBM z15
- Designed to meet the requirements of a broad range of data center designs, including hot/cold aisle containment setups
- IBM z16 will be the last generation to support Bulk Power Assembly (BPA) power
- External Water Cooling (WCU) and Internal Battery Feature (IBF) are not supported
- Clients upgrading from IBM z14 or older will experience footprint, cabling, and power changes



IBM z16 Single Frame footprint overview

- 19" rack design factory-installed into standard 42U IBM frame (same as z15 T02)
- Powered with 2 or 4 IBM iPDUs
 - **IBM recommendation:** power via redundant sources
 - Single-CPC drawer systems: single-phase **or** 3-phase power; dual-CPC drawer systems: 3-phase power required
- 8 configuration options; each component has a fixed location within frame
 - 1-2 CPC drawers, 0-3 I/O drawers
- No 16U Reserve feature or plan-ahead features available



IBM z16 Rack Mount footprint overview

- Modular 19" design **SSR-installed into client frame**
- Powered with **client's PDUs**
 - Client's PDUs must account for service clearances
 - IBM recommendation: power via redundant sources
- 8 configuration options; **height ranges from 10U-39U**
 - 1 or 2 CPC drawers; 0-3 I/O drawers
 - Component stack order is pre-defined
- **One or more system** (z16 Rack Mount, storage, networking, etc.) may be installed **within one rack**
 - IBM z16 Rack Mount components **must be contiguous**

Requires additional pre-planning for successful install!!



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HyperLink	IBM logo*	z15	
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